

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:
Haase, Richard A.

Filed: March 1, 2004

Title: Water Combustion Technology -
Methods, Processes, Systems and
Apparatus for the Combustion of
Hydrogen and Oxygen

§ Serial No.: 10/790,316
§
§ A continuation of PCT/US 03/11250
§ and PCT/US 03/41719
§
§ Claiming Priority of:
§ PCT/US 03/11250 filed 4/10/03,
§ PCT/US 03/41719 filed 10/11/03,
§ 60/447,880 filed 2/14/03,
§ 60/404,644 filed 8/19/02,
§ 60/379,587 filed 5/10/02, and
§ 60/371,768 filed 4/11/02.

DECLARATION OF MR. CHESTER A. VAUGHAN

My name is Mr. Chester A. Vaughan. I am of sound mind and am capable of making this Declaration based on the facts stated herein.

1. I have a BS degree in Mechanical Engineering from Virginia Polytechnic Institute (VA Tech) and over 50 years of experience in the Aerospace industry. I worked for the NASA (National Aeronautics and Space Administration) for over 40 years. Most of that time I worked in the technical disciplines associated with space propulsion and power systems dealing with high energy propellants and reactants and the associated hardware to make those system function efficiently and safely on manned spacecraft. I worked on the Gemini, Apollo, Skylab, Space Shuttle and the International Space Station systems. Also, during that time, I spent approximately 10 years managing a test facility that dealt with rocket engines, pyrotechnic devices, cryogenic fluids (Oxygen, Hydrogen, Nitrogen and Helium), hydraulic systems and turbine and internal combustion engines. After retiring from NASA, I worked for 10 years with The Boeing Company on the International Space Station Program. All of my employment time at Boeing was spent in the International Space Station Chief Engineers Office and I was the Chief Engineer when I retired.
2. I have entered into an agreement with Richard Haase and ClearValue, Inc. to provide expertise in relation to an engine method and device for which Mr. Richard Haase has a patent pending under U.S. Patent Application 10/790,316. While I do not normally perform consulting, my billing rate to ClearValue, Inc. for these services is agreed to be

\$1.00 and that is the rate which I have agreed upon with Mr. Haase. My fee is not contingent upon any results that I obtain but is for my professional services. I personally know of Richard Haase through acquaintances in my field of work. I have no affiliation with him or his company, ClearValue, Inc. and have no interest in the outcome of patent application of Mr. Richard Haase.

3. I have reviewed the pending claims within the styled application, which are evidenced herein as Exhibit A, along with the styled patent application, which teaches improvements to the art claimed in Exhibit A.
4. Based on my experience, I believe I should be viewed as someone of expert skill in the art of combustion science and engineering. *Based on my review of Mr. Haase's pending claims, as evidenced in Exhibit A, I believe that the pending claims of this patent comprise a novel approach which would satisfy a long felt need for humanity.*
5. My decision that Mr. Haase's pending claims answer a long felt need of humanity is first based upon the fact that prior to and subsequent to Mr. Haase's pending claims, there is no solution within the art for a combustion engine which would operate without the production of oxides of carbon. There is a long felt need for a combustion engine which would operate without the production of oxides of carbon and which provides adequate power and/or torque per displacement. As is known by most of humanity, global climate change is a significant threat to life as is known today; therefore, the long felt need of a combustion engine which would operate without the production of oxides of carbon has been a persistent and well known long felt need for those in the art and has been known by those of ordinary skill in the art.
6. My decision that Mr. Haase's pending claims answer a long felt need of humanity is second based upon the fact that no one else prior to or since Mr. Haase's pending claims has satisfied humanity's long felt need for a combustion engine which would operate without the production of oxides of carbon and which would provide adequate power and/or torque.
7. My decision that Mr. Haase's pending claims answer a long felt need of humanity is third based on my belief that application of Mr. Haase's pending claims, along with knowledge of those of ordinary skill in the art, will answer the long felt need of humanity for a

combustion engine which operates without the production of oxides of carbon and which would provide adequate power or torque.

8. As claimed by Mr. Haase, the use of pure Oxygen instead of air eliminates the dilution effect of nitrogen which allows significant lower peak combustion pressure for the same torque when compared with the current internal combustion engines (or higher torque with comparable peak combustion pressure). While, the industry has recently pursued and is pursuing, options such as pollution control equipment on the current Internal combustion engines, battery and fuel cell electric motor driven systems (including hybrids) to deal with this long felt need for humanity, all of these pursuits have significant disadvantages when compared with the concept described and claimed by Mr. Haase in his patent application (U. S. Patent Application 10/790,316). The following is a more detailed discussion of the pertinent features and benefits of the patent:

- a. A method of hydrogen combustion which produces no oxides of carbon and no oxides of nitrogen has been a long felt need of humanity; no solution has been previously presented. Previous and on-going attempts of others to solve this long felt need include, but are not limited to, fuel cells, batteries and electric motors and the combustion of hydrogen with air. Fuel cells, utilizing air for its source of oxygen, are less desirable due to many factors including, but not limited to: equipment cost, platinum availability, and the production of oxides of nitrogen. Combustion of hydrogen with air is proving a challenge due to the production of oxides of nitrogen and due to the available torque per cubic inch of displacement. This is all while the environmental consequences increase daily of humanity's combustion of hydrocarbon fuel. I would also state that said long felt industry need has been known by those of ordinary skill in the art, as well as those of expert skill in the art, of combustion engines and of combustion furnaces for a considerable time previous to the priority date of Mr. Haase's patent application, U.S. Patent Application 10/790,316.
- b. A method of hydrogen combustion which produces little to no oxides of carbon nor of nitrogen has been a long felt need which has been known by those or

ordinary and of expert skill in the art of combustion and of turbo-machinery for many years, wherein there has not been previously presented a solution.

- c. At this time, there is no known method or apparatus to combust hydrogen with a pure form of oxygen without storage of oxygen, a rather combustible and dangerous material to store.
- d. I would state that a method or apparatus to combust hydrogen with a pure form of oxygen, as claimed, answers said long felt need.
- e. As I have read and understand in the claims, the invention of Mr. Haase, U.S. Patent Application 10/790,316, proposes a method and an apparatus to combust a pure form of hydrogen with a pure form of oxygen, wherein a portion of the combustion energy is used to cryogenically distill air as a means to provide a pure form of oxygen to combustion. It is my opinion that this technique and the claims therein answer a long felt industry need known by those of ordinary and of expert skill in the art, as well as a long felt need of humanity.
- f. As I have read and understand in the claims, the invention of Mr. Haase, U.S. Patent Application 10/790,316, proposes a method and an apparatus to combust a pure form of hydrogen with a pure form of oxygen, wherein a portion of the combustion energy is used to cryogenically distill air to provide a pure form of oxygen to combustion. It is my understanding that this approach will increase the amount of hydrogen and of oxygen in the combustion chamber, thereby improving available torque per cubic inch of combustion chamber. It is my opinion that this technique and the claims therein answer a long felt industry need known by those of ordinary and of expert skill in the art, as well as a long felt need of humanity.
- g. As I have read and understand the claims, the invention of Mr. Haase, U.S. Patent Application 10/790,316, proposes a method and an apparatus to combust a pure form of hydrogen with a pure form of oxygen, wherein a portion of the combustion energy is used to cryogenically distill air to provide a pure form of oxygen to combustion while using the available cryogenic nitrogen as a means of reducing the temperature of stored hydrogen to a temperature below the joule

Thompson curve of hydrogen, thereby improving the storage effectiveness of hydrogen. It is my opinion that this approach and the claims therein answer a long felt industry need known by those of ordinary and of expert skill in the art, as well as a long felt need of humanity.

- h. As I have read and understand the claims, the invention of Mr. Haase, U.S. Patent Application 10/790,316, the techniques and methods discussed above, including the benefits can be applied to jet engines, e.g. turbo-machinery. It is my opinion that this technique and the claims therein answer a long felt industry need known by those of ordinary and of expert skill in the art, as well as a long felt need of humanity.
 - i. While the invention and apparatus claimed and described by Mr. Haase within U.S. Patent Application 10/790.316 represents significant advantages over current approaches and pursuits, the description also represent some development and integration challenges including startup transients which must be overcome to be successful. However, with advances in materials and technology, etc., I believe the patent should be granted and the concept developed.
9. As combustion methods, engines and devices is a significant market and as there exist many marketed devices within the combustion, engine and turbo-machinery industries in combination with a world wide knowledge of the environmental consequences of hydrocarbon combustion methods, there should not previously nor today exist any lack of interest or lack of appreciation of an invention's potential or marketability to a method or apparatus as claimed and presented in U.S. Patent Application 10/348,071.
 10. I have read and understand the prior art of record cited against U.S. Patent Application 10/348,071, specifically U.S. Pat. Nos. 4,841,731; 7,062,912; 6,588,212; 5,899,072; 5,516,359; 4,440,545; 3,975,913; 4,664,857; and 6,698,183. While the prior art cited teaches aspects of the pending claims, it is my professional opinion that the prior art does not render the pending claims obvious; as if it had, someone else would have developed by now.
 11. I hereby declare that all statements made herein are of my own knowledge are true and that all statements made on information and belief are believed to be true; and further these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 Title 18 of the United States Code and

that such willful false statements may jeopardize the validity of this application or any patent issued thereon.

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Signature of Declarant

EXHIBIT A

216. An engine comprising a combustion chamber, wherein a mixture of oxygen, as O_2 , and hydrogen, as H_2 , is combusted, wherein

at least a portion of said oxygen is obtained by the separation of air, wherein the separation of air is selected from the group consisting of:

- (a) cryogenic separation,
- (b) membrane separation,
- (c) pressure swing adsorption, and

any combination thereof, wherein

at least a portion of the energy of combustion creates at least one of:

mechanical rotating energy, and

steam in the combustion chamber, wherein

at least one of the mechanical rotating energy and the steam powers at least a portion of said air separation, and wherein

the temperature of combustion is at least partially controlled with the addition of water to said combustion chamber in a way that maintains combustion or combustion exhaust temperature.

217. (Canceled)

218. The engine of claim 216, wherein said rotating mechanical energy turns a generator to create electrical energy.

219. The engine of claim 216, wherein the steam produced by combustion turns a steam turbine, and wherein

said steam turbine turns a generator to create electrical energy.

220. The engine of claim 216, wherein heat is created.

221. (Canceled)

222. The engine of claim 218 or 219, wherein at least a portion of said electrical energy is used in the electrolysis of water to hydrogen and oxygen, and wherein

at least a portion of at least one of said hydrogen and oxygen is used in said mixture.

223. The engine of claim 216, further comprising nitrogen or argon in said mixture.
224. The engine of claim 216, wherein said oxygen further comprises air.
225. The engine of claim 216, wherein at least a portion of the steam produced by combustion is converted to hydrogen by the corrosion of at least one metal.
226. The engine of claim 225, wherein the conversion of said steam into said hydrogen is increased by an electrical current in said metal(s).
227. The engine of claim 225 or 226, wherein said hydrogen is at least partially used in said mixture.
228. The engine of claim 216, wherein a generator turns due to the movement of air or water, and wherein
said generator creates electrical energy, and wherein
said electrical energy is at least partially utilized in the electrolysis of water to hydrogen and oxygen, and wherein
at least a portion of at least one of said hydrogen and oxygen is used in said mixture.
229. The engine of claim 216, wherein a photovoltaic cell creates electrical energy, wherein
said electrical energy is at least partially used in the electrolysis of water to hydrogen and oxygen, and wherein
at least a portion of at least one of said hydrogen and oxygen is used in said mixture.
230. (Canceled)
231. The engine of claim 216, wherein at least a portion of the nitrogen separated from air in said cryogenic air separation unit is used to cool any portion of at least one selected from a list consisting of: said cryogenic air separation unit, the storage of oxygen, the storage of hydrogen, electrolysis, coolant for said engine, said engine and any combination thereof.
232. The engine of claim 231, wherein said nitrogen separated from air in said cryogenic

air separation unit is at least partially used to cool air or water.

223 – 234. (Canceled)

235. The engine of claim 216, wherein said oxygen separated from air is at least one of enriched oxygen, pure oxygen and very pure oxygen.

236. (Canceled)

237. The engine of claim 216, wherein at least one selected from a list consisting of a: corrosion inhibitor, chelant, dispersant and any combination therein is added to at least a portion of the water in said engine.

238. The engine of claim 216, wherein said engine performs at least one of: internal, turbine and heating combustion.

239. The engine of claim 216, wherein at least one of oxygen and hydrogen is stored in at least one of a cooled gas state and a liquid state by liquefaction.

240. The engine of claim 239, wherein compressor(s) for at least one of cooling and liquefaction is powered by at least one of said engine and a fuel cell.

241. The engine of claim 240, wherein said fuel cell is powered by hydrogen and at least one of oxygen and air.

242. The engine of claim 216, wherein at least one of said hydrogen and oxygen is stored in a mixture with frozen water crystals to form a gel.

243. The engine of claim 216, wherein at least one selected from a list consisting of: hydrogen, oxygen and water is preheated prior to combustion with the energy from at least one selected from a list consisting of: ambient temperature, said engine, said engine exhaust, an electrical radiant heat source and any combination therein.

244. The engine of claim 216, wherein said mechanical rotating energy enters a transmission, wherein

said transmission engage in a manner that is inversely proportional to at least one of the torque and work output of said engine, and wherein

said transmission output mechanical rotating energy turns a generator to create electrical energy.

245. The engine of claim 244, wherein said transmission engage a flywheel capable of storing rotational kinetic energy, wherein

said flywheel turns said generator.

246. The engine of claim 244, wherein at least a portion of said electrical energy is used in the electrolysis of water to hydrogen and oxygen.

247. The engine of claim 246, wherein at least a portion of at least one of said hydrogen and oxygen is used in said mixture.

248. The engine of claim 216 or 219, wherein a pressure control device is in said engine exhaust.

249. The engine of claim 216, wherein at least one of said engine combustion heat energy and said engine exhaust energy is used to heat at least one of a gas and a liquid.

250. The engine of claim 249, wherein at least one of the gas is air and the liquid is water.

251. The engine of claim 250, wherein said exhaust discharge directly into said air or water.

252. The engine of claim 216, wherein at least a portion of said engine is insulated.

253. The engine of claim 216, wherein hydrogen is separated from at least one selected from a list consisting of: water, air, nitrogen, oxygen and any combination thereof within said air separation unit.

254 – 257. (Canceled)

258. The engine of claim 216, wherein the temperature of said engine exhaust is at least partially cooled with the addition of water to said engine exhaust.

259. The engine of claim 258, comprising jet propulsion.

260. The engine of claim 216 or 258, comprising rocket propulsion.

Claims 261 - 341 (Withdrawn)

342. The engine of claim 216, wherein said engine comprises a turbine.

Claims 343 - 349 (Withdrawn)

350. The engine of claim 216, comprising jet propulsion wherein air is stoichiometrically increased in the jet intake for hydrogen thermodynamics and/or to operate with excess air for cooling.